# “Limnological study of Aquatic Animals of Parola lake in Hingoli District of Maharashtra.”

A

Synopsis

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## Doctor of Philosophy

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# “Limnological study of Aquatic Animals of Prola lake in Hingoli District of Maharashtra.”

## Introduction to proposed research topic:

The present work will be carried out on topic “Limnological study of Aquatic Animals of Parola lake in Hingoli District of Maharashtra.” Freshwater bodies are very important in the nature. Limnology is a very useful tool to study the entire ecosystem. Review of literature reveals that much work has not been done in this area on such topic. In the present study Parola lake in Hingoli District of Maharashtra is selected. It is necessary to study the physicochemical parameters to know the water quality which support the life in that aquatic ecosystem. To employ scientific methods for aquaculture, understanding of environmental conditions prevailing in the water body is essential. Increased attention is, therefore, be given to the physico-chemical factors, since they directly or indirectly affect fishes and other aquatic inhabitants. This research is proposed to examine the limnological study, which involves Assessment of Physicochemical parameters of water and Study of biodiversity of Zooplanktons. Freshwater bodies are very important in the nature. They provide habitat to the living aquatic organisms and also drinking water to other organisms in the vicinityPhysicochemical parameters of Gulabsagar water body in Jodhpur was studied by Chouhan and Vyas (2017).India has vast freshwater resources in the form of both lentic and lotic ecosystems. The lentic ecosystems include ponds, lakes, tanks and reservoirs. The perennial tanks play an important role as a valuable water resource for domestic, agriculture and aquaculture. The lentic ecosystems have long attracted the attention of ecologists, both for their importance as the source of drinking water and in the development of fisheries. To employ scientific methods for aquaculture, understanding of environmental conditions prevailing in the water body is essential. Increased attention is, therefore, be given to the physico-chemical factors, since they directly or indirectly affect fishes and other aquatic inhabitants. Lakes are socioeconomically and bio aesthetically important aquatic ecosystem. Water is a essence of life and it is needed for drinking purposes, domestic uses, for irrigation of crops, production of different goods and for recreational purposes. Global studies show challenging future and a chaotic view when considering total use and water availability, in third millenium. The physico-chemical characteristics of any water body or any aquatic ecosystem and the nature and distribution of its biota are directly related to and influenced by each other and controlled by a multiplicity of natural regulatory mechanisms. Living plants

and animals are affected by chemical conditions of their environment and the reactions may be used to measure some of the conditions.

Freshwater ecosystems play a crucial role in maintaining biodiversity, supporting livelihoods, and contributing to the overall ecological balance. Among these ecosystems, lakes represent complex biological environments that host a variety of aquatic animals and plants, influencing the local climate and surrounding ecosystems. Parola Lake, located in Hingoli District of Maharashtra, is one such freshwater body that serves as a habitat for diverse aquatic organisms. However, like many lakes, it faces environmental pressures due to anthropogenic activities such as agricultural runoff, urbanization, and pollution.

Limnology, the study of inland water bodies, including their biological, chemical, and physical aspects, provides essential insights into the functioning of aquatic ecosystems. Limnological studies are pivotal for understanding how water quality and other environmental factors influence aquatic biodiversity. By examining parameters such as water temperature, pH, dissolved oxygen, and nutrient levels, researchers can assess the health of the ecosystem and predict future changes due to natural and human-induced factors.

The proposed research focuses on the limnological study of aquatic animals in Parola Lake. This study aims to explore the relationship between the lake's physical and chemical properties and the diversity and abundance of its aquatic animals. The research will investigate the seasonal variations in water quality and its impact on the distribution of species, and it will examine how local human activities influence the aquatic ecosystem.

## The proposed research work is based on "Limnological study of Aquatic Animals of Parola lake in Hingoli District of Maharashtra."

### Survey of review of literature and development in the relevant subject:

The study of limnology has evolved significantly over the past few decades, with researchers focusing on understanding the complex relationships between water quality, biodiversity, and human activity in freshwater ecosystems. Early studies primarily concentrated on the physical and chemical aspects of lakes, such as water temperature, pH, dissolved oxygen, and nutrient concentrations. Researchers like Horne and Goldman (1994) have laid the foundation for understanding how these limnological parameters influence aquatic life. More recent studies have shifted towards a more integrated approach, examining the interaction between abiotic factors and biotic components, including the diversity and behaviour of aquatic animals in response to changes in water quality (Wetzel, 2001).

Several studies have highlighted the importance of freshwater ecosystems in maintaining biodiversity and supporting human communities. For instance, studies conducted by Carpenter et al. (1992) and Munkittrick et al. (2000).

Building on the foundational studies in limnology, recent research has emphasized the importance of understanding the local and regional ecological dynamics of freshwater bodies. In particular, studies conducted by Bhagat et al. (2017).

In terms of ecological health, numerous studies have focused on the specific impact of seasonal changes on aquatic animal populations. For example, the work by Chakraborty, S. K., Sanyal, P., & Ray, R. (2023) explored the seasonal variations in aquatic animal populations in India, linking changes in water temperature, dissolved oxygen, and pH with breeding cycles, migratory patterns, and population dynamics of aquatic species. These seasonal shifts are especially critical in temperate and subtropical lakes, where factors like monsoon rains can drastically alter water chemistry and, consequently, aquatic life.

## The main objectives of this research are:

- To assess the diversity of aquatic animals in Parola Lake.
- To examine the limnological parameters that affect the aquatic ecosystem, including temperature, pH, dissolved oxygen, and nutrient levels.
- To evaluate the impacts of human activities on the lake's biodiversity and ecological health.
- To provide recommendations for the conservation and sustainable management of Parola Lake.

This study is significant because it addresses the need for a comprehensive understanding of freshwater ecosystems, especially in regions where aquatic biodiversity is threatened by human activity. By focusing on Parola Lake, the research will contribute valuable insights to the field of limnology and provide a foundation for effective conservation strategies, ensuring the long-term sustainability of the lake's aquatic life.

## Hypothesis:

**Hypothesis ($H_1$):**
There is a significant relationship between the limnological parameters of Parola Lake and the diversity and abundance of its aquatic animals.

**Hypothesis 2 ($H_1$):**
Human activities, such as agriculture and fishing, have a significant impact on the water quality and biodiversity of aquatic animals in Parola Lake.

**Hypothesis 3 ($H_1$):**
Seasonal variations significantly influence the diversity and distribution of aquatic animals in Parola Lake.

**Null Hypothesis**

Null Hypothesis ($H_0$):
There is no significant relationship between the limnological parameters of Parola Lake and the diversity and abundance of its aquatic animals.

Null Hypothesis 2 ($H_0$):
Human activities, such as agriculture and fishing, have no significant impact on the water quality and biodiversity of aquatic animals in Parola Lake.

Null Hypothesis 3 ($H_0$):
Seasonal variations do not significantly influence the diversity and distribution of aquatic animals in Parola Lake.

## Methodology to be used and adopted:

**Sampling and Data Collection:** Periodic collection of water and aquatic animal samples at different locations within the lake.

**Water Analysis:** Measurement of physicochemical parameters such as pH, temperature, dissolved oxygen, and nutrient levels.

**Species Identification:** Identification and classification of aquatic species using standard taxonomic keys.

## Importance of the Study:

International Status

Freshwater ecosystems globally are under significant threat due to pollution, climate change, and habitat destruction. Research on aquatic ecosystems contributes to global efforts in biodiversity conservation, such as the UN Sustainable Development Goals (SDG 14: Life Below Water). This study aligns with international initiatives aimed at preserving freshwater biodiversity and managing aquatic habitats sustainably.

National Status

In India, freshwater lakes serve as crucial resources for biodiversity, water supply, and livelihoods. However, many of these ecosystems face degradation due to urbanization, agricultural runoff, and unregulated activities. This study will contribute to national biodiversity conservation

programs such as the National Biodiversity Action Plan (NBAP) and support policymaking by providing specific data on freshwater biodiversity and ecosystem health.

Regional Status

Parola Lake, situated in the Hingoli District of Maharashtra, is a significant freshwater body supporting local biodiversity and livelihoods. However, like many other lakes in the region, it is exposed to pressures from increasing human activities, including agriculture and fishing. This study will help to understand the ecological dynamics of the lake and provide a framework for addressing environmental issues at a regional level, contributing to the sustainable development of the Hingoli district.

The findings will be valuable not only for academic research but also for policymakers, conservationists, and local communities, fostering a deeper understanding of freshwater ecosystems and contributing to environmental conservation efforts at all levels.

## Scope of the Study:

This study offers a comprehensive assessment of the aquatic biodiversity of Parola Lake by investigating the following:

- Limnological parameters, including water quality, nutrient levels, and physical conditions.
- Diversity, distribution, and abundance of aquatic animals.
- Impact of human activities and environmental changes on the lake's ecosystem.
- Strategies for the conservation and sustainable management of Parola Lake.

**Year-wise plan of work and target to be achieved:**

Year 1: Preliminary Study and Planning

Activities: onduct a detailed review of literature on limnological studies and aquatic biodiversity.

Perform reconnaissance surveys of Parola Lake to identify sampling sites and establish a study framework.

Procure necessary equipment and develop a methodology for sample collection and analysis.

Target: inalize the research design and sampling protocol.

Prepare an initial report summarizing the literature review and field observations.

**Year 2: Data Collection and Fieldwork**

Activities: onduct seasonal sampling of water and aquatic animal species at predetermined sites.

Measure limnological parameters, including water quality (pH, dissolved oxygen, temperature, and nutrient levels).

Identify and document aquatic species using taxonomic methods.

Target: Complete two cycles of seasonal data collection.

Generate preliminary data on species diversity and limnological parameters.

**Year 3: Data Analysis and Interpretation**

Activities: Analyze collected data to assess biodiversity patterns and correlations with limnological parameters.

Evaluate the impact of anthropogenic activities on the aquatic ecosystem of Parola Lake.

Identify key threats to the lake's biodiversity and ecological health.

Target: Prepare a comprehensive analysis report.

Draft conservation strategies based on the findings.

**Year 4: Finalization and Reporting**

Activities: Synthesize all findings and insights into a final report.

Prepare and submit research papers for publication in peer-reviewed journals.

Organize awareness programs or workshops to share findings with stakeholders, including local communities and policymakers.

Target: Submit the final research report.

Publish at least two research papers in reputed journals.

Develop a conservation framework for Parola Lake.

Expected outcomes: Comprehensive Biodiversity Inventory:

A detailed documentation of aquatic animal species present in Parola Lake, including their diversity, abundance, and distribution patterns.

Limnological Insights: Analysis of key limnological parameters such as water quality, pH, temperature, and nutrient levels, providing an understanding of the lake's ecological health.

Impact Assessment: Identification of the effects of anthropogenic activities, such as agricultural runoff, fishing, and pollution, on the lake's aquatic ecosystem.

Ecological Health Evaluation: Evaluation of the relationship between aquatic biodiversity and environmental conditions, contributing to the understanding of the ecological dynamics of Parola Lake.

Conservation Strategies: Development of evidence-based recommendations and strategies for the sustainable management and conservation of the lake and its biodiversity.

Policy and Community Engagement: Creation of awareness among local communities and policymakers about the importance of preserving freshwater ecosystems.

Contribution to Scientific Knowledge: Enhanced understanding of limnology and aquatic biodiversity in the regional and national context, with potential implications for similar freshwater ecosystems.

These outcomes aim to provide a significant scientific basis for conservation efforts and contribute to maintaining the ecological balance of Parola Lake.

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